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## RECENT LITERATURE

Goldman, Edward A. MAMMALS OF PANAMA. Smithsonian Misc. Coll., vol. 69, no. 5, pp. 1-309, text figures 1-24, pls. 1-39. 1920.

Goldman's "Mammals of Panama" is an excellent summary of existing knowledge of the mammal fauna of one of the most interesting portions of tropical America, interesting not only on account of its varied topography and consequent diverse conditions of environment, but especially from its geographic position, "forming as it does a slender artery blending the complex elements or converging life currents of two continents, through which countless migrations of non-volant terrestrial animals probably passed during the Tertiary or early Quaternary ages." The work is based primarily on the author's personal explorations and field work, for which he was detailed from the Bureau of Biological Survey, United States Department of Agriculture, in December, 1910, in coöperation with other departments of the Government in a Biological Survey of the Panama Canal Zone under the auspices of the Smithsonian Institution. Mr. Goldman's explorations were made in the Canal Zone and in eastern Panama, where he prosecuted field work for about six months in 1911, and for about the same period in 1912, devoting his attention mainly to mammals and birds. He has, however, availed himself in the preparation of this report on the mammals of all the mammal material obtained in Panama, both prior and subsequent to his own explorations, contained in American museums, and has thus been able to correlate the published results of other workers through a critical examination of the actual specimens on which their results were based. Fortunately for the completeness of his monograph, he has been able to utilize much of the material obtained by J. H. Batty (now in the American Museum of Natural History) and that of W. W. Brown, collected for the Bangs Brothers (now in the Museum of Comparative Zoology at Cambridge) in western Panama (province of Chiriqui and the Coiba and Perlas Islands), and the collections made by H. E. Anthony and W. B. Richardson in southeastern Panama for the American Museum of Natural History in 1914 and 1915. This, with a few other smaller collections available for examination forms a large total, but still, says the author, "Exploration of mountain ranges between the Canal Zone and the lofty Volcan de Chiriqui would add much to our knowledge of the distribution of many mountain mammals now known only from the extreme eastern or western parts of the republic."

The general introduction contains the author's itineraries and a summary of other explorations (pp. 4-18) followed by an account of the physiography and climatology (pp. 19-23), and a discussion of the faunal relations and life zones of Panama. The mammalian fauna of Panama, as a whole, "is South American in the sense that most of the genera and many of the species are common to both regions." The eastern and western parts present important faunal differences, the eastern being "more truly South American, especially the mountainous parts, while western Panama partakes of the character of the Central American subregion." That the Canal Zone tends "to delimit faunas is indicated by the distribution of various species."

Three life zones are recognized: (1) a Lower Tropical, (2) an Upper Tropical, and (3) a Temperate. The Lower Tropical Zone is an area of high temperature and includes "by far the greater part of the Isthmian land surface from the

Atlantic to the Pacific," ranging to about 3000 to 3500 feet altitude on the slopes of the higher mountains. It is divided into two nearly parallel areas, the humid or northern, and the arid or southern, characterized by a greater and more continuous rainfall in the humid area. The Upper Tropical Zone is of comparatively small extent, occupying four small isolated areas, two at the eastern and two at the western end of the republic. It occupies the crests and slopes of the mountains up to about 8000 feet. The Temperate Zone is confined to a small area on Volcan de Chiriqui above an altitude of about 8000 feet. The life zones are indicated in color on the accompanying large-scale map, which shows the drainage and locality names with great distinctness. The faunal zones and areas are characterized in the text by not only their physiographic features but by lists of their characteristic mammals, birds and plants. The author calls attention (p. 25, footnote) to the agreement, in their general bearings, of the life zones of Panama, as here worked out, with those established by Doctor Chapman for Colombia, based on the birds. "Although working independently," he says, "the results are substantially in accord regarding the number, approximate boundaries, and appropriate nomenclature of the zones."

The "General Account of the Mammals" occupies nearly two hundred pages and includes 175 forms (species and subspecies).<sup>1</sup> The treatment consists of brief general comment under the higher groups, a reference to the place of original description of the species or subspecies and statement of the type locality, with synonyms when such exist, followed by remarks on the distribution, habits and relationships of the forms, and finally a list of the specimens examined and their localities, and, when not contained in the National Museum, the name of the museum to which they belong. It is therefore an elaborately annotated faunal list of the known mammals of Panama, with hitherto unpublished field notes of the author and all available information on the ranges and life histories of the forms recorded, supplemented by historical and technical information where such comment is required. The work is also liberally illustrated. The first nineteen of the thirty-nine halftone plates are scenic, effectively illustrating the physiography and the vegetation of various types of environment. The remaining twenty halftone plates illustrate the type skulls of forty-six forms of mammals, all but three of which were originally described by the author in earlier papers. Noteworthy among these are *Neacomys pictus* and *Icticyon panamensis*, which greatly extend the known range of their respective genera. The text illustrations consist of life size figures (front views of head) of twenty-four of the thirty-three genera of bats here recorded from Panama. An annotated list of sixty-seven titles of papers (by twenty-nine authors) cited in the text, and an index of forty-three pages complete a work of great merit and permanent value. The "Mammals of Panama" is thus a critical and comprehensive review, for which specialists of Central American mammalogy, as well as a much broader clientele, should feel deeply grateful.

—J. A. Allen.

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<sup>1</sup> These are listed on pages 42-44, but are not numbered, nor are the authorities for the names included, nor are page references given. Had these been included, and the list inserted as part of the table of contents, it would have greatly facilitated finding any desired species in the text. Apparently the number of forms is nowhere stated, although an item of statistical information usually of much interest.